DOCUMENT RESUME

ED 400 196 SE 059 081

AUTHOR Bitner, Betty L.

TITLE Interactions between Hemisphericity and Learning Type, and Concept Mapping Attributes of Preservice and Inservice Teachers.

PUB DATE 2 Apr 96

NOTE 16p.; Paper presented at the Annual Meeting of the National Association for Research in Science Teaching (St. Louis, MO, March 31-April 4, 1996).

PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.

DESCRIPTORS *Brain Hemisphere Functions; *Cognitive Style; *Concept Mapping; Elementary Secondary Education; *Science Teachers; Teacher Education

ABSTRACT

The purpose of this study was to determine whether hemisphericity and learning type are related to concept mapping attributes of preservice and inservice teachers. In addition, differences in concept mapping by program (i.e., preservice elementary/middle school and secondary science teachers and inservice elementary/middle school teachers), learning type, and hemisphericity were investigated. Hemisphericity and learning type were measured by the Hemispheric Mode Indicator and 4MAT Learning Type Measure respectively. Concept maps were constructed by the teachers and scored on a seven attribute rubric. Statistically significant intercorrelations were found between hemisphericity and learning type as well as between the attributes within the concept maps. However, concept mapping attributes did not correlate significantly with hemisphericity and learning type. The ANOVA (Analysis Of Variance) indicated that the inservice elementary/middle school teachers performed significantly better in concept mapping than the preservice elementary/middle school and secondary science teachers. Contains 21 references. (Author)

INTERACTIONS BETWEEN HEMISPHERICITY AND LEARNING TYPE, AND CONCEPT MAPPING ATTRIBUTES OF PRESERVICE AND INSERVICE TEACHERS

Betty L. Bitner

Professor of Secondary Education, Foundations, and Educational Technology

Southwest Missouri State University

Springfield, MO 65804

(417) 836-5795

BEB105F@WPGATE.SMSU.edu

FAX (417) 836-4884

Farella L. Shaka

Associate Professor of Physics and Astronomy

Southwest Missouri State University

Springfield, MO 65804

(417) 836-5131

FLS219F@WPGATE.SMSU.edu

FAX (417) 836-6934

Paper presented at the annual meeting of the National Association for Research in Science Teaching, April 2, 1996, St. Louis, Missouri.

Abstract

The purpose of this study was to determine whether hemisphericity and learning type are related to concept mapping attributes of preservice and inservice teachers. Also, differences in concept mapping by program (i.e., preservice elementary/middle school and secondary science teachers and inservice elementary/middle school teachers), learning type, and hemisphericity were investigated. Hemisphericity and learning type were measured by the Hemispheric Mode Indicator and 4MAT Learning Type Measure, respectively. Concept maps were constructed by the teachers and scored on a seven attribute rubric. Statistically significant intercorrelations were found between hemisphericity and learning type as well as between the attributes within the concept maps. However, concept mapping attributes did not correlate significantly with hemisphericity and learning type. The ANOVA analysis indicated that the inservice elementary/middle school teachers performed significantly better in concept mapping than the preservice elementary/middle school and secondary science teachers.

Purpose of the Study

The purpose of this study was to determine whether hemispheric mode and learning type are related to concept mapping attributes of preservice and inservice teachers in science methods and theory courses. In addition, differences in concept mapping by program (i.e., preservice elementary/middle school and secondary science teachers and inservice elementary/middle school teachers), learning type or quadrant, and hemispheric mode were investigated.

Significance of the Study

Researchers (e.g., Germain, 1993; McCarthy, 1987, 1990; Samples,1992; Samples & Hammond,1985) have indicated that learners have a preferred learning type or mode but should be challenged to develop and use other learning modes to perceive and process information. If a direct

relationship is found between the learning type and concept mapping, learners should be able to construct concept maps with much facility. However, if an inverse relationship between learning type and concept mapping is established, concept mapping might provide a viable approach for challenging learners to develop non-preferred learning types or modes.

Related Literature

Concept mapping as espoused by Novak and Gowin (1984) has its roots in the Ausubelian theory of meaningful learning and constructivist epistemology (Novak, 1990). Novak and Gowin's approach to concept mapping requires a hierarchy of concepts linked together with meaningful propositions.The differentiation and integration of concepts are shown through the branching and cross linking of concepts. Researchers (e.g., Beyerbach,1988; Cleare, 1983; Malone & Dekkers,1984; Novak & Gowin) used analytic scoring in which criteria such as propositions, levels or hierarchy, cross links, and examples were assessed.Wallace and Mintzes (1990) added branching to the four criteria established by Novak and Gowin.

Researchers (e.g., Cliburn,1990; Heinze-Fry & Novak, 1990) have shown that concept mapping promotes meaningful learning. In addition, Malone & Dekkers (1984) and Mason (1992) have suggested concept mapping is an effective instructional tool. Horton et al.'s (1993) meta analysis of 19 studies showed that generally concept mapping had a medium effect on achievement and a large positive effect on students' attitudes.

Researchers have studied the interaction of concept mapping and different learning attributes. Stensvold and Wilson (1990) failed to find a significant relationship between concept mapping and verbal ability. However, they found that the number of valid links on a map predicted students' comprehension. Okebukola and Jegede (1988) in a study of the effect of cognitive preference (recall, principles, questioning, and application) and two learning modes (cooperative and individualistic) on meaningful learning through concept mapping found that students with a preference for principles had the highest concept

mapping mean scores. Secondly, students working in cooperative groups had significantly higher mean scores.

Hemisphericity, learning types, and learning modalities have been studied by researchers such Carbo, Dunn and Dunn, Kolb, McCarthy and Germain, and Samples. The Hemispheric Mode Indicator (HMI) and the Learning Type Measure (LTM) developed by McCarthy and Germain (1993) were used in this study. McCarthy (1987) suggested learners have a preferred mode of learning; however, she has advised that we must challenge learners to develop all learning modes by varying our instructional approaches. Samples and Hammond (1985) identified five learning modalities (symbolic or abstract, visual or spatial, auditory, kinesthetic, and synergic). They stated that students usually have a strong preference for one mode even though they express and receive information in all five modes. McCarthy's (1987, 1990) exposition of the 4MAT LTM and the HMI indicated that the left and right halves of the brain process information differently. Even though we usually use both modes when processing information, most individuals demonstrate a preference for one mode over the other. The left mode is described as serial, analytical, rational, and verbal, whereas the right mode is said to be global, visual, and holistic. Students with a left brain preference process information in a systematic and sequential manner, but right brain students seek patterns and use intuition, beliefs, and opinions. In the 4MAT system she devised a vertical continuum for perception and a horizontal continuum for processing information. Superimposed on each other, these produced four major learning types or quadrants: Quadrant 1-imaginative learners, Quadrant 2- analytic learners, Quadrant 3-common sense learners, and Quadrant 4-dynamic learners.

Design and Procedures

Population and Sample

The convenience sample ($\underline{N}$ = 58) consisted of 11 preservice secondary science teachers and 34 preservice elementary/middle school teachers enrolled in science methods

courses and 13 inservice elementary/middle school teachers enrolled in a theory and practice course.

Instruments

Two inventories were administered to the subjects. The Hemispheric Mode Indicator (HMI) measures right and left brain approaches to learning (McCarthy & Germain,1993). The 4MAT Learning Type Measure (4MAT LTM) (McCarthy & Germain, 1993) categorizes learners into four learning quadrants. Quadrant 1, the imaginative learners, focus on finding meaning. Quadrant 2, analytic learners, find order. Those who experiment are common sense learners, Quadrant 3. The dynamic learners, Quadrant 4, create.

Included in the HMI are thirty-two bi-polar items for which the subjects have four possible choices (i.e., a lot or somewhat under either Column A or Column B of the bi-polar items). An example of bi-polar items is intellectual rigor versus imagination. The scores on the HMI range between -64 and 64: -64 to -8 indicating left brain preference, -8 to -2 indicating whole brain favoring left brain preference, -2 to 2 indicating whole brain preference, 2 to 8 indicating whole brain favoring right brain preference, and 8 to 64 indicating right brain preference.

The 4MAT LTM consists of two parts used to describe the different ways in which people learn. Part A measures learning preferences with Part B describing the learner. Based upon the responses to the Part A, the learner is categorized in one of the four learning quadrants. The quadrant scores range from 15 through 60. Descriptions as learners, as leaders, as teachers, and as parents are provided for each quadrant. However, for the purposes of this study, only those descriptors of learner will be used.

From Part B the doing and watching scores are derived. The total doing/watching score ranges from -12 to 12 (doing = 1 to 12; watching = -12 to -1).

Content, construct, and concurrent validities were established on both instruments by Excel, Inc. (Germain, 1993). Cronbach's alpha for the four learning quadrants and the

Watching/Doing component of the HMI ranged between .835 and .885 except for quadrant 3, .767. Also established were internal consistency and test-retest reliabilities.

A rubric (Shaka & Bitner, 1996) was used to score the concept maps. The rubric was used to assess the learners' concept mapping on the basis of seven attributes: propositions, hierarchy, branches, differentiation of concepts in each branch, cross links, examples, and degree of conceptualization. The scale of the seven attribute rubric ranges from 4 through 0 with 4 indicating most complete, valid, and significant attributes and 0 denoting missing or invalid attributes. The total score possible on the rubric is 28. For the rubric and the procedures for establishing interrater reliability, see Shaka & Bitner.

Procedures

The HMI and 4MAT LTM were administered to the sample at the beginning of the courses. However, the data for the two inventories were not analyzed until the concept maps had been constructed and scored.

The three classes received the same instruction on concept mapping (Novak & Gowin, 1984) and the nature of science. For the inservice teachers, the nature of science was a review. The elementary teachers had constructed language webs, but had not constructed concept maps. Few of the secondary teachers were knowledgeable of webbing or concept mapping.

The teachers were instructed to construct a concept map on their beliefs about teaching science in respect to **what.** In the construction of the map, they were advised to focus on five broad areas (the branches): (a) processes; (b) broad areas or strands of natural science; (c) products or knowledge; (d) attitudes; and (e) SMTEVS (Science, Mathematics, Technology, Environment, Values, and Society). They were informed that the maps would be scored on whether they were complete and contained valid and significant branches, propositions, superordinate concepts, subordinate concepts, a hierarchy, examples, and cross links. Each map was scored independently by two university professors and then the ratings were discussed and final scores recorded.

Statistical Analysis of Data Procedures

SPSS Release 4.1 statistical programs were used to analyze the data. Pearson product-moment correlation coefficient was used to determine whether hemisphericity and learning type relate to concept mapping attributes. Anova was used to analyze differences in concept mapping attributes by program, hemisphericity, doing/watching score, and learning type or quadrant. The level of significance was established at $p < .05$.

Results

Presented in Table 1 are the means and standard deviations for all variables. The means for concept mapping (with standard deviations in parentheses) for the preservice elementary teachers, preservice secondary science teachers, and inservice elementary teachers were 13.62 (3.48), 12.36 (3.53), and 20.00 (5.87), respectively.

Significant inverse correlations between hemisphericity and LTM quadrants 2 and 3 and significant direct correlations between hemisphericity and LTM quadrants 1 and 4 were found (see Table 2). These findings indicate that positive HMI scores (i.e., right brain) relate to quadrant 1 in which learners take in information concretely and process it reflectively and quadrant 4 in which learners also perceive information concretely but process it actively. The inverse correlations suggest the left brain or negative HMI scores relate to LTM quadrant 2 in which learners perceive information abstractly and process it reflectively and quadrant 3 in which the learners take in information abstractly and process it actively. The intercorrelations between the HMI and LTM indicate internal consistency.

Except for the attribute branches, the intercorrelations between the concept mapping attributes and the total concept mapping score were significant at $p < .01$ (see Table 2). As reported in the procedures section, the branches were given to the students prior to the construction of the maps. The intercorrelations between the seven attributes on the concept map and the concept map total score indicate internal consistency.

Statistically significant intercorrelations between hemisphericity, learning type, and concept mapping were not found.

The ANOVA for differences in concept mapping scores by program was statistically significant in favor of the inservice elementary/middle school teachers, $F(2, 57) = 16.24$, $p = .000$. However, learning type and hemispheric mode did not yield a significant difference in concept mapping scores.

Discussion

The findings indicate that positive HMI scores (i.e., right brain) relate to Quadrant 1 in which learners take in information concretely and process it reflectively and Quadrant 4 in which learners also perceive information concretely but process it actively. The inverse correlations suggest the left brain or negative HMI scores relate to LTM Quadrant 2 in which learners perceive information abstractly and process it reflectively and Quadrant 3 in which the learners take in information abstractly and process it actively. The intercorrelations between the HMI and LTM indicate internal consistency.

The significant negative correlation between HMI and propositions indicates the more negative the HMI score (i.e., more left brain hemisphericity) the higher the score in propositions. Except for branches, the same trend was found for correlations between the HMI and the other attributes in the concept map; however, they were not statistically significant. The LTM Quadrant 4 learners, those who perceive information concretely and process it actively, did not perform well on the proposition aspect of the map. Except for branches, the same trend was found for the other attributes; however, they were not statistically significant. The intercorrelations between the seven attributes in the concept map and between the seven attributes and the total score inidcate internal consistency.

A plausible explanation for the inservice elementary/middle school teachers outperforming the preservice elementary/middle and secondary teachers in concept mapping is their prior experience with other schematics diagrams, such as webbing.

References

Beyerbach, B.A. (1988). Developing a technical vocabulary: Preservice teachers' concept maps. Teaching and Teacher Education, 4 (4), 339-347.

Cleare, C.C. (1983). Using concept mapping to detect intervention effective in improving pre-service elementary education majors' understanding of science topic. In H. Helm & J.Novak (Eds.), Proceedings of the International Seminar on Misconceptions in Science and Mathematics, vol. 1, (pp. 272-281), Ithaca, NY: cornell University.

Cliburn, J.W., Jr. (1990). Concept maps to promote meaningful learning. Journal of College Science Teaching,19 (4), 212-217.

Germain, C. S. (1993). 4 thought. Research, commentary, & studies on 4mat. Barrington, IL: Excel Inc.

Heinze-Fry, & J.A., Novak, J.D. (1990). Concept mapping brings long-term movement toward meaningful learning. Science Education, 74, 461-472.

Horton, P.B., McConney, A.A., Gallo, M., Woods, A.L., Senn, G.J., Hamelin, D.(1993). Investigation of the effectiveness of concept mapping as an instructional tool. Science Education, 77, 95-111.

Malone, J., & Dekkers, J. (1984). The concept map as an aid to instruction in science and mathematics. School Science and Mathematics, 84 (3), 220-231.

Mason, C.L. (1992). Concept mapping: A tool to develop reflective science instruction. Science Education, 76 (1), 51-63.

McCarthy, B. (1987). The 4mat system. Teaching to learning styles with right/left mode techniques. Barrington, IL: Excel, Inc.

McCarthy, B. (1990). Using the 4mat system to bring learning styles to schools. Educational Leadership, 48 (2), 31-37.

McCarthy, B., & Germain, C.S. (1993). Hemispheric mode indicator (hmi). Barrington, IL: Excel, Inc.

McCarthy, B., & Germain, C.S. (1993). Learning type measure. Barrington, IL: Excel, Inc.

Novak, J.D. (1990). Concept maps and Vee diagrams: Two metacognitive tools to facilitate meaningful learning. Instructional Sciences, 19, 29-52.

Novak, J.D., & Gowin, B.D. (1984). Learning how to learn. New York: Cambridge University Press.

Okebukola, P.A., Jegede, O.J. (1988). Cognitive preference and learning mode as determinants of meaningful learning through concept mapping. Science Education, 72 489-500.

Samples, B. (1994). Instructional diversity. Teaching to your students' strengths. The Science Teacher, 61 (2), 14-17.

Samples, B. (1992). Using learning modalities to celebrate intelligence. Educational Leadership, 50 (2), 62-66.

Samples, B., & Hammond, B. (1985). Holistic learning. The Science Teacher, 52 (8), 40-43.

Shaka, F.L., Bitner, B.L. (1996, January). Construction and validation of a rubric for scoring concept maps. Paper presented at the annual meeting of the Association for the Educators of Teachers of Science, Seattle, Washington.

Stensvold, M.B., & Wilson, J.T. (1990). The interaction of verbal ability with concept mapping in learning from chemistry laboratory activity. Science Education, 72 (4), 489-500.

Wallace, J.D., & Mintzes, J.J. (1990). The concept map as a research tool: Exploring conceptual change in biology. Journal of Research in Science Teaching, 27, 1033-1052.

Table 1

Means and Standard Deviations for Hemispheric Mode Indicator, Learning Type Measure and Concept Mapping Attributes According to Program and Total (N = 58)

Program	(n_1 = 34)		(n_2 = 11)		(n_3 = 13)		(N = 58)	
Variables	M	SD	M	SD	M	SD	M	SD
HMI[a]	3.32	1.51	2.64	1.50	2.54	1.76	.05	18.31
Doing[b]	5.00	4.05	4.91	3.18	6.08	4.27	5.22	3.91
Watching[c]	-6.77	3.73	-7.09	3.18	-5.92	4.27	-6.64	3.72
D/W Total[d]	1.91	.90	1.82	.87	1.92	.95	-.98	7.48
Quad 1[e]	42.12	7.37	42.76	6.05	41.42	7.29	42.12	7.01
Quad 2	35.65	8.04	37.86	6.77	38.39	7.50	36.59	7.66
Quad 3	38.06	5.60	39.15	5.22	39.15	8.11	38.35	6.08
Quad 4	32.24	9.56	32.00	6.50	30.62	8.18	33.00	8.76
Proposition	2.65	.85	2.27	.91	3.31	.75	2.72	.89
Hierarchy	1.63	.65	1.55	.69	2.54	1.05	1.81	.89
Branches	3.50	.86	3.55	1.04	3.46	1.13	3.50	.94
Differentiation of Concepts	1.71	.58	1.55	.52	2.85	.90	1.93	1.81
Cross links	1.21	.98	1.00	1.00	2.77	1.30	1.52	1.25
Examples	1.00	1.89	1.09	.94	2.31	.95	1.31	.82
Degree of Conceptualization	1.65	.60	1.36	.51	2.69	.95	1.83	.82
Concept Mapping Total	13.62	3.48	12.36	3.53	20.00	5.87	14.64	5.00

Note. n_1 = preservice elementary teachers, n_2 = preservice secondary science teachers, n_3 = inservice elementary teachers.

Possible score for attributes = 4. Possible total concept mapping score = 28.

[a]Possible range = -62 through 64. [b]Possible range = 0 through 12. [c]Possible range = -12 through 0. [d]Possible range = -12

through 12. [e]Possible range = 15 through 60.

BEST COPY AVAILABLE

Table 2

Intercorrelations between Hemispheric Mode and Learning Type, and Concept Mapping Attributes for Preservice Elementary and Secondary Teachers and Inservice Elementary Teachers (N = 58)

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. HM	1.00	.40**	.40**	.41**	.55**	-.79**	-.61**	.67**	-.29*	-.13	.24	-.14	-.22	-.16	-.12	-.16
2. Doing	.40**	1.00	.96**	.93**	.04	-.37**	-.14	.40**	-.18	.10	.04	-.00	.02	.13	-.02	.02
3. Watching	.40**	.96**	1.00	.96**	.03	-.42**	-.18	.48**	-.18	.11	.06	-.00	.00	.13	-.01	.03
4. D/W Total	.41**	.93**	.96**	1.00	.06	-.39**	-.20	.44**	-.16	.08	.08	.01	.02	.12	-.00	.02
5. Quad 1	.55**	04	.03	.06	1.00	-.53**	-.62**	.09	.05	-.02	.13	.00	-.10	-.16	.00	-.03
6. Quad 2	-.79**	-.37**	-.42**	-.39**	-.53**	1.00	.44**	-.76**	.19	.01	-.13	.09	.12	.06	.04	.07
7. Quad 3	-.61**	-.14	-.18	-.20	-.62**	.44**	1.00	-.59**	.17	.11	-.24	.02	.03	.11	.05	.05
8. Quad 4	.67**	.40**	48**	.44**	.09	-.76 **	-.59**	1.00	-.31*	-.07	.18	-.10	-.04	-.01	-.07	-.08
9. Proposition	-.29*	-.18	-.18	-.16	.05	.19	.17	-.31*	1.00	.49**	.04	.53**	.43**	.37**	.48**	.62**
10. Hierarchy	-.13	.10	.11	.08	-.02	.01	.11	-.07	.49**	1.00	.41**	.77**	.54**	.66**	.81**	.87**
11. Branches	.24	.04	.06	.08	.13	-.13	-.24	.18	.04	.41**	1.00	.32*	.25	.14	.36**	.47**
12. Differentiation of Concepts	-.14	-.00	.00	.01	.00	.09	.02	-.10	.53**	.77**	.32*	1.00	.59**	.64**	.90**	.88**
13. Cross links	-.22	.02	.00	.02	-.10	.12	.03	-.04	.43**	.54**	.25	.59**	1.00	.52**	.69**	.78**
14. Examples	-.16	.13	.13	.12	-.16	.06	.11	-.01	.37**	.66**	.14	.64**	.52**	1.00	.70**	.77**
15. Degree of Conceptualization	-.12	-.02	-.01	-.00	.00	.04	.05	-.07	.48**	.81**	.36**	.90**	.69**	.70**	1.00	.93**
16. CM Total	-.16	.02	.03	.03	-.03	.07	.05	-.08	.61**	.87**	.47**	.88**	.78**	.77**	.93**	1.00

*p < .05, two-tailed. **p < .01, two-tailed.

Table 3

Analysis of Variance for Concept Mapping by Program and Learning Type Quadrant (N = 58)

Source	df	F Concept Mapping
		Between subjects
Main Effects	5	7.33*
Program (A)	2	16.24*
Preferred LTM Quadrant (B)	3	1.34
A x B	5	2.31

*$p < .0001$.

Appendix A

RUBRIC FOR SCORING CONCEPT MAPS

(Shaka & Bitner, 1996)

	4	3	2	1	0
Propositions	Complete, meaningful, and valid.	Most are meaningful and valid.	Some are meaningful and valid.	Incomplete, few are meaningful.	Missing or not meaningful.
Hierarchy	Superordinate & subordinate concepts are present and valid.	Most but not all are present and valid.	Some are present and valid.	Few are present and/or valid. Several subordinate concepts are missing.	Hierarchy is missing or invalid.
Branches	All are appropriate, meaningful, and valid.	Most are appropriate, meaningful, and valid.	Some are appropriate, meaningful, and valid.	Few are appropriate, meaningful, and valid	Missing, inappropriate or invalid.
Differentiation of concepts in each branch.	All valid subconcepts are present.	Most of the valid subconcepts are present.	Some of the valid subconcepts are present. Some subconcepts are invalid or trivial.	Few of the valid sub-concepts are present and/or most of the subconcepts are invalid or trivial.	Valid subconcepts are missing or subconcepts are invalid.
Cross links	All are valid and non-trivial. Strong evidence of higher level of thinking.	Most are valid and non-trivial. Some evidence of higher level thinking.	Some valid but trivial. Some evidence of higher level thinking	Most are invalid or trivial. Little evidence of higher level thinking.	Missing or invalid. No evidence of higher level thinking.
Examples	Complete set; valid, illustrative, and significant.	Incomplete set; but most are present and valid, illustrative, and significant.	Incomplete set; but some are present and valid, illustrative, and significant.	Incomplete set; few are present and valid, illustrative, or significant.	Missing or invalid.
Degree of conceptualization	Evidence of clear understanding of concept.	High degree but not complete understanding of concept.	Moderate degree of understanding of concept. Some naive or faulty conceptions.	Low degree of understanding of concept. Several naive or faulty conceptions.	Evidence of complete lack of understanding of concept.

SE059081

ERIC®

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement (OERI)
Educational Resources Information Center (ERIC)

REPRODUCTION RELEASE
(Specific Document)

I. DOCUMENT IDENTIFICATION:

Title: Interactions Between Hemisphericity and Learning Type, and Concept Mapping Attributes of Preservice and Inservice Teachers	
Author(s): Betty L. Bitner and Farella L. Shaka	
Corporate Source:	Publication Date: April 2, 1996

II. REPRODUCTION RELEASE:

In order to disseminate as widely as possible timely and significant materials of interest to the educational community, documents announced in the monthly abstract journal of the ERIC system, *Resources in Education* (RIE), are usually made available to users in microfiche, reproduced paper copy, and electronic/optical media, and sold through the ERIC Document Reproduction Service (EDRS) or other ERIC vendors. Credit is given to the source of each document, and, if reproduction release is granted, one of the following notices is affixed to the document.

If permission is granted to reproduce the identified document, please CHECK ONE of the following options and sign the release below.

[x] Sample sticker to be affixed to document

Check here
Permitting microfiche (4" x 6" film), paper copy, electronic, and optical media reproduction.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Betty L. Bitner
Sample
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)"

Level 1

Sample sticker to be affixed to document [ ]

"PERMISSION TO REPRODUCE THIS MATERIAL IN OTHER THAN PAPER COPY HAS BEEN GRANTED BY
Sample
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)"

or here
Permitting reproduction in other than paper copy.

Level 2

Sign Here, Please

Documents will be processed as indicated provided reproduction quality permits. If permission to reproduce is granted, but neither box is checked, documents will be processed at Level 1.

"I hereby grant to the Educational Resources Information Center (ERIC) nonexclusive permission to reproduce this document as indicated above. Reproduction from the ERIC microfiche or electronic/optical media by persons other than ERIC employees and its system contractors requires permission from the copyright holder. Exception is made for non-profit reproduction by libraries and other service agencies to satisfy information needs of educators in response to discrete inquiries."

Signature: Betty L. Bitner	Position: Professor of SEFET
Printed Name: Betty L. Bitner	Organization: Southwest Missouri State U.
Address: Hill Hall, SMSU 901 S. National St. Sprinfield, MO 65804	Telephone Number: (417) 836-5795
	Date: 10-02-96

OVER

Share Your Ideas With Colleagues Around the World

Submit your conference papers or other documents to the world's largest education-related database, and let ERIC work for you.

The Educational Resources Information Center (ERIC) is an international resource funded by the U.S. Department of Education. The ERIC database contains over 820,000 records of conference papers, journal articles, books, reports, and non-print materials of interest to educators at all levels. Your manuscripts can be among those indexed and described in the database.

Why submit materials to ERIC?

- **Visibility.** Items included in the ERIC database are announced to educators around the world through over 2,000 organizations receiving the abstract journal, *Resources in Education* (*RIE*); through access to ERIC on CD-ROM at most academic libraries and many local libraries; and through online searches of the database via the Internet or through commercial vendors.

- **Dissemination.** If a reproduction release is provided to the ERIC system, documents included in the database are reproduced on microfiche and distributed to over 900 information centers worldwide. This allows users to preview materials on microfiche readers before purchasing paper copies or originals.

- **Retrievability.** This is probably the most important service ERIC can provide to authors in education. The bibliographic descriptions developed by the ERIC system are retrievable by electronic searching of the database. Thousands of users worldwide regularly search the ERIC database to find materials specifically suitable to a particular research agenda, topic, grade level, curriculum, or educational setting. Users who find materials by searching the ERIC database have particular needs and will likely consider obtaining and using items described in the output obtained from a structured search of the database.

- **Always "In Print."** ERIC maintains a master microfiche from which copies can be made on an "on-demand" basis. This means that documents archived by the ERIC system are constantly available and never go "out of print." Persons requesting material from the original source can always be referred to ERIC, relieving the original producer of an ongoing distribution burden when the stocks of printed copies are exhausted.

So, how do I submit materials?

- Complete and submit the *Reproduction Release* form printed on the reverse side of this page. You have two options when completing this form: If you wish to allow ERIC to make microfiche and paper copies of print materials, check the box on the left side of the page and provide the signature and contact information requested. If you want ERIC to provide only microfiche copies of print materials, check the box on the right side of the page and provide the requested signature and contact information. If you are submitting non-print items or wish ERIC to only describe and announce your materials, without providing reproductions of any type, please contact ERIC/CSMEE as indicated below and request the complete reproduction release form.

- Submit the completed release form along with two copies of the conference paper or other document being submitted. There must be a separate release form for each item submitted. Mail all materials to the attention of Niqui Beckrum at the address indicated.

For further information, contact...

Niqui Beckrum
Acquisitions Coordinator
ERIC/CSMEE
1929 Kenny Road
Columbus, OH 43210-1080

1-800-276-0462
(614) 292-6717
(614) 292-0263 (Fax)
ericse@osu.edu (e-mail)